Enhancing Louisiana's Share of Census-Derived Federal Revenues

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2002 Report to LTIF

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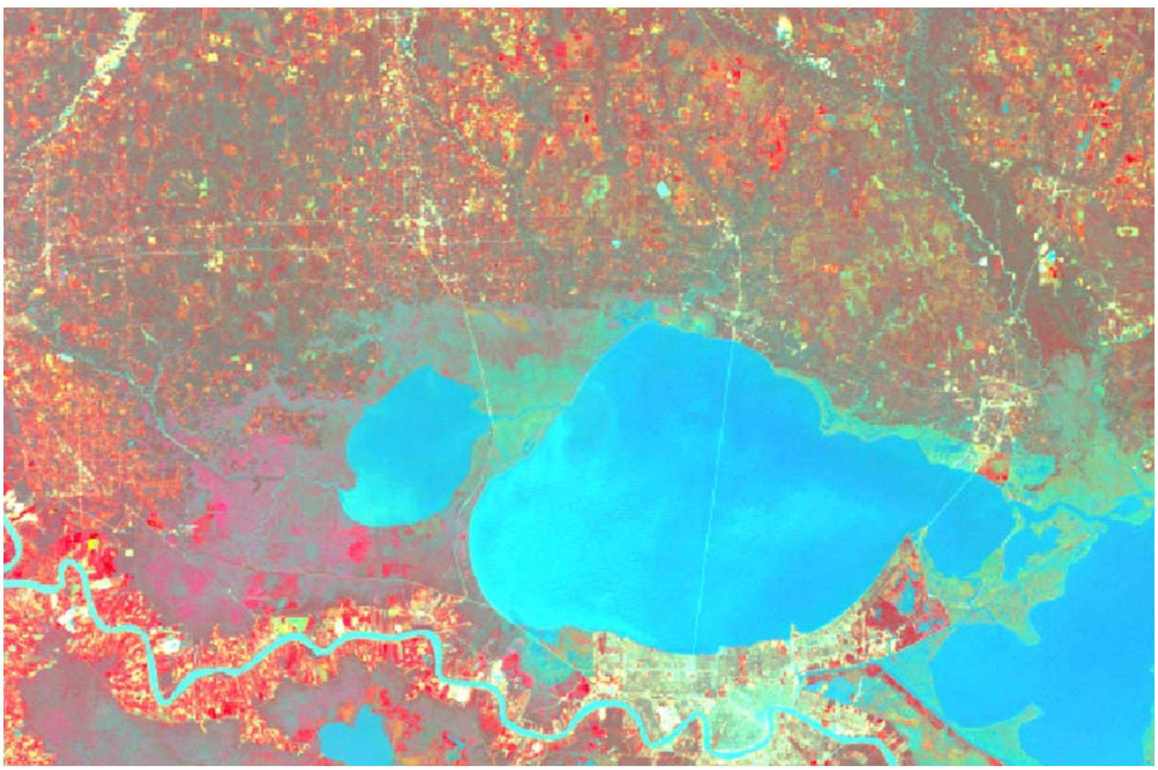

Figure 1 LANDSAT 5 Image of the Southeastern Louisiana Study Area

Enhancing Louisiana's Share of Census-Derived Federal Revenues

In the winter of early 1999 I knew there was something amiss with the TIGER file for St. Tammany Parish. The Bureau of the Census' national digital street map is a dreadnaught in the U.S. Government's fleet of geographic databases. The name TIGER, and the pesky mascot the Bureau uses as a logo on every TIGER CD and publication, belies the rigor of the massive effort to capture the nation's spatial organization.

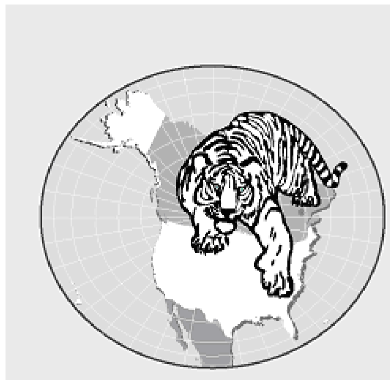

Figure 2 Cover Of The TIGER Technical manual

The cover is where any pretense of TIGER's user-friendliness ends. The opening passages of the documentation posted by the Bureau captures the outlines of this formidable mine of data:

What Is TIGER®?

The U.S. Census Bureau's Census TIGER® System automates the mapping and related geographic activities required to support the decennial census and sample survey programs of the U.S. Census Bureau starting with the 1990 decennial census. The Census TIGER® System provides support for the following:

• Creation and maintenance of a digital geographic data base that includes complete coverage of the United States, Puerto Rico, the Virgin Islands of the United States, and the Pacific Island Areas

• Production of maps from the Census TIGER® data base for all U.S. Census Bureau enumeration and publication programs

• Ability to assign individual addresses to geographic entities and census blocks based on polygons formed by features such as roads and streams

The design of the Census TIGER® data base adapts the theories of topology, graph theory, and associated fields of mathematics to provide a disciplined, mathematical description for the geographic structure of the United States and its territories. The topological structure of the Census TIGER® data base defines the location and relationship of streets, rivers, railroads, and other features to each other and to the numerous geographic entities for which the U.S. Census Bureau tabulates data from its censuses and sample surveys. It is designed to ensure that there is no duplication of features or areas.[1]

[1] Census 2000 TIGER/Line Files Technical Documentation/prepared by the U.S. Census Bureau-Washington, DC; 2000

TIGER is an acronym for *topologically integrated geographic encoding and referencing.* One of its main uses is to serve as a set of pigeonholes, millions of pigeonholes, into which flow data including total population, population by race, by age, by gender, and quite literally, thousands of other items. Census data collection hinges on TIGER and the related work of the Census' Geography Division. The Geography Division's partner, the Population Division knows where to go to enumerate the population based on information gathered from TIGER. So, it is easy to make out a case for arguing that TIGER is the skeleton on which we hang our demography and ensuing claims to Federal tax shares.

Despite TIGER's mathematical sophistication, it is important to monitor it carefully. TIGER has been through several editions since its debut in the late 1980s. One of the things TIGER tries to capture is the national pattern of forming boundaries around segments of the populace. There is an enormous amount of variety in how states vary in forming internal boundaries. Louisiana is not a particularly complex case. Rather, it conforms to a fairly straightforward and logical hierarchy based on its parishes and municipalities. Other states, both to the east and west, have to deal with tribal areas, some of which have sovereign characteristics, and independent cities that are counties within counties. The following diagram summarizes the complexity of U.S. territorial divisions.

At the bottom of the diagram the basic territorial / statistical unit is the block. In an urban area a census block is coterminous with a normal city block. There are several tens of thousands of blocks in Louisiana. Block groups (BG) gather several contiguous blocks into a small neighborhood statistical unit. Block groups, in turn, are collected into tracts. Tracts are special units in some respects, since the Bureau maintains their borders across censuses to help historical comparisons. Tracts are often subdivided, but can be reassembled by computer (aggregated) easily. Tracts in Louisiana stop at parish lines. Parish data are essentially a sum-of-tracts.

The sequence: block, BG, tract, parish, state is a tidy hierarchical nesting system. Falling outside of it are several kinds of units we take for granted, including precincts (voter tally districts or VTDs), municipalities and suburban areas (Places), school districts, and various political units for the Louisiana Legislature and Congress.

Each one of these units, and the ones I glossed over, is treated in Census data as "summary levels". Summary levels are statistical shorthand for a class of boundary objects, ranging from blocks to states. The point is, if the blocks are wrong, the errors compound all the way up. So, even though it is tedious, every state has to be diligent in tending to its blocks. What I was aware of in late 1998 was a disparity between TIGER blocks and what was really on the ground. For a state that had lost a congressional seat and an electoral vote (which after 2000 we no longer take for granted), each block is worth fighting over.

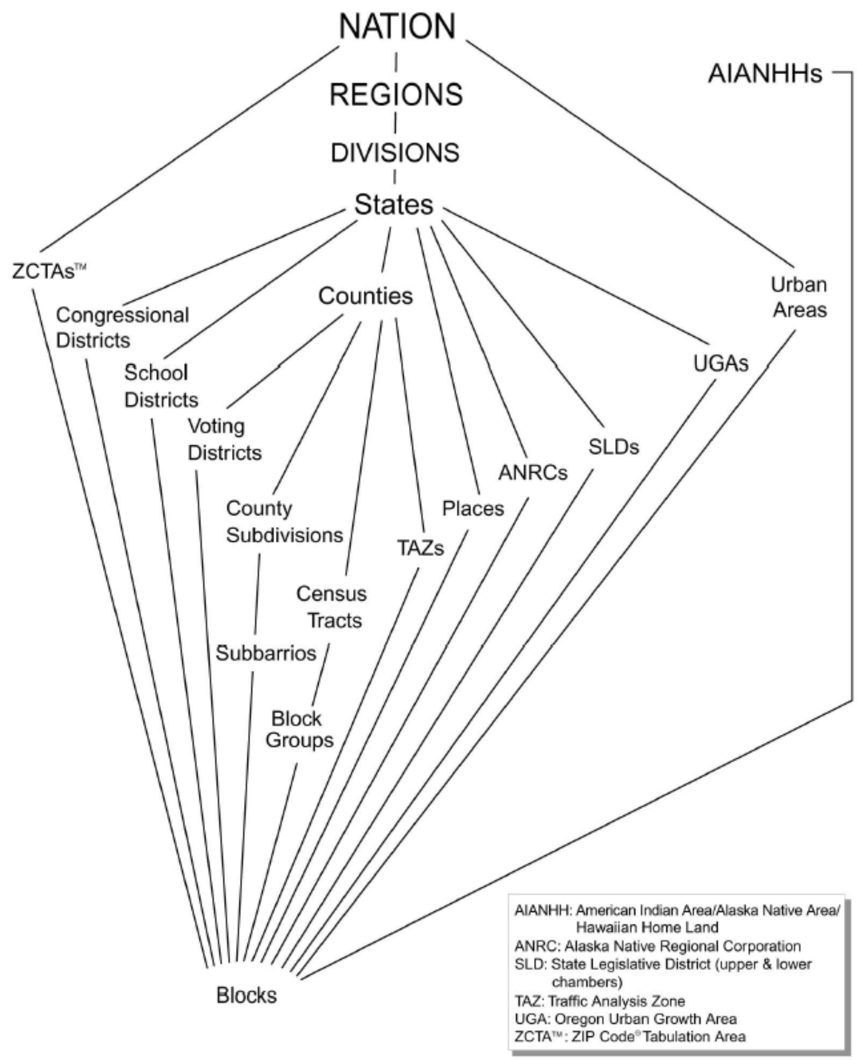

Figure 3 The Variety of U.S. Territorial Divisions

Urban Sprawl and Census Mapping

I had been sensitized to Census mapping problems by experience in the 1980s with the Bureau's first digital mapping system, the DIME (dual independent map encoding) files and eventually the first iteration of TIGER. This was a period of intense national argument over redistricting along racial lines. Louisiana was to become part of the gerrymandering battleground, whose most intense struggles started in North Carolina and covered a swath all the way to Texas.

As the decade drew to a close another issue involving the census, and general human geography, became important to the public: urban sprawl. It is distinct from, though not entirely separate, from "white flight," gentrification, and the erosion of the tax bases of central cities. Taken as a whole, these issues are amenable to analysis, though not solution, with census data and digital mapping systems.

It took no special genius to catch on to the fact that St. Tammany Parish was the focus of an exodus from Orleans and Jefferson Parish. It was certainly true of my family. The population changes in St. Tammany were massive in the mid and late 1990s. The commercial centers of Slidell and Covington-Mandeville grew, it seemed, almost overnight.

I started to anticipate a rematch of the gerrymandering skirmishes of following the 1990 Census, and began to wonder how the TIGER file was reflecting physical changes in St. Tammany. Essentially, all geography is local. What I noticed was that the 1995 TIGER file was not much different from that of 1989. The 1997 TIGER file did not show any visible changes. This was when I began to get concerned. It was apparent to me that TIGER, or what I could see of it, was falling behind sprawl. There is no helping sprawl, of course, since it has no technical fix. But documenting it accurately is amenable to technical fixing.

Validating The TIGER File

One key scientists use to validate measurement and theory is replication. There are two obvious strategies of replication: (a) do the same thing in another place, or (b) use another method in the same place. Validating local census data is a case (b) instance. To me the best way to validate TIGER was to compare it to mapping data from another technology.

TIGER, since it based on graph theory (which has nothing to do with graphs as we know them, but with networks of points, lines, and enclosed figures called polygons) falls into a family of mapping techniques called "vector GIS". It is still a kind of chapel or sect in Geography, and we owe our street maps and road maps to vector GIS. On the other hand, we owe our terrain maps largely to another geographical chapel that divides the world into little gridded square tiles called "pixels," short for "picture element." Arrays of pixels form pictures such as those on television or computer monitors. These images are sometimes called "rasters." So, the stage was set in the 1970s for two warring academic taunts: "raster is faster" and "vector is corrector."

I am agnostic in this issue, as are most GIS students of the 21st century, who will take data in either form. In this case what is useful about raster data is that it can often be used to validate vector data. If a line shows up in a raster image, it ought to appear in a vector GIS, everything else being equal.

The Search For Raster Data

Up until three years ago, getting raster data at a resolution capable of detecting a street was not easy. That is, everything else was not equal. TIGER files appeared to follow the centerlines of streets 15' to 30' wide. Readily available raster data had a nominal resolution of 30 meters. So, I had to start looking for something that had not readily available spatial resolution, and recent enough to capture the sprawl-burst of the mid 90s in Louisiana. So, there were two issues: spatial resolution and temporal resolution.

This pair of standards ruled out aerial photography archives, since they lacked temporal resolution. I knew that there had been progress in satellite resolution since the 1980s, and I had done some work with the French SPOT products. But SPOT's 10m panchromatic (b&w) resolution fell a bit short of being a precision validation tool. In the U.S. there was a prospective launch of an instrument called IKONOS with a 1m. pan product. It was ideal, but not deployed, much less operational.

Russian data, stemming from the Strategic Arms Limitation Treaty regime on national technical means of verification seemed to me at first an unlikely source. But I found some samples, slightly degraded, on the new Terraserver website. It was really useful even at reduced resolution. The real data, at 2m., would give me a good look at street networks, and it was, as I discovered, timely (1998).

The following figure shows a portion of a SPIN-2 image acquired in the Spring of 1998 near Mandeville and the terminus of the Lake Pontchartrain Causeway. The road and urban street network are clearly visible in this image, which is not enhanced in any special way. The image looks like an ordinary photograph. This is only natural since this particular satellite uses a film camera rather than a digital sensor. Film canisters are ejected and parachuted to Earth before the satellite's destruction upon reentry into the atmosphere.

The geometry of the image has been georeferenced. That is, the horizontal and vertical arrangements of the pixels conform to a planar map projection (flat representation of the Earth) commonly used by Louisiana geographers and planners called UTM-15.[2] Reprojecting TIGER files, which come in latitude / longitude decimal degrees to UTM (expressed in x and y meters) takes a matter of minutes. Projecting raster files, in this case one pixel for every 2 meter segment of Louisiana from Baton Rouge Slidell, to Chalmette and back along the Mississippi takes weeks to set up and a few days to compute. In this kind of application, raster is not faster. But, in an odd reversal of the usual assumptions, it is "corrector" *-than TIGER.

[2] Universal Transverse Mercator, Zone 15. UTM is a very common projection for regional areas and is a *de facto* rather than official standard in the State

Figure 4 SPIN-2 Image of Lake Pontchartrain Northshore

Map Comparisons

The advantage of georeferencing is that once tied to a standard frame of reference, a map can be easily laid atop or side by side to another in the same referencing system and easily compared. In this project, both TIGER and SPIN were geometrically tied to UTM-15 with GIS and image processing software (ArcInfo and ERDAS). The footprint of the imagery encompasses these Parish boundaries, though the Russians actually photograph a swath of Earth with many photographs, which are scanned and then stitched together by the image processing software. They pay no particular heed to administrative boundaries.

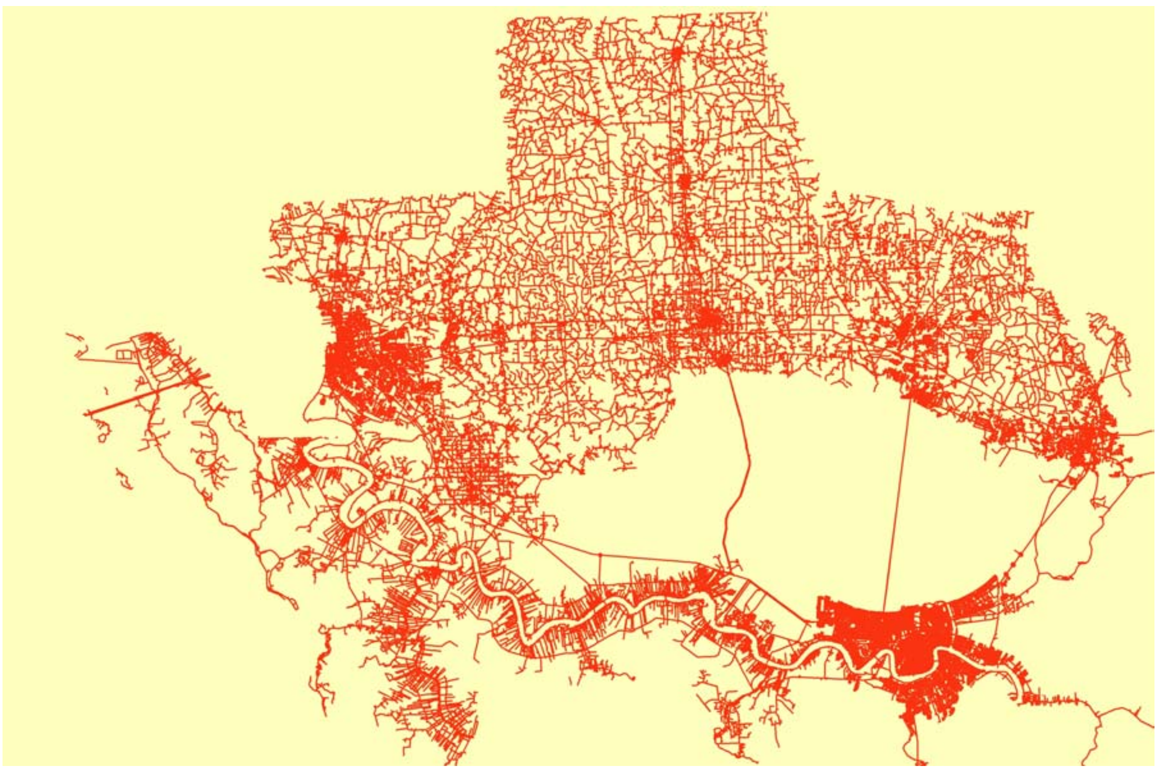

Figure 5 TIGER Validation Study Area: 160,000 Line Segments.

The next figure illustrates how the georeferenced layers formed by the quilt of Parish TIGER files and SPIN images fit together. The street pattern of Mandeville is visible on the imagery, and highlighted by the TIGER line segments. Both maps generally agree on where the streets are. But there are some exceptions. In the upper right corner of the image it is possible to pick out what appear to be streets that are either not mapped, or mapped incorrectly.

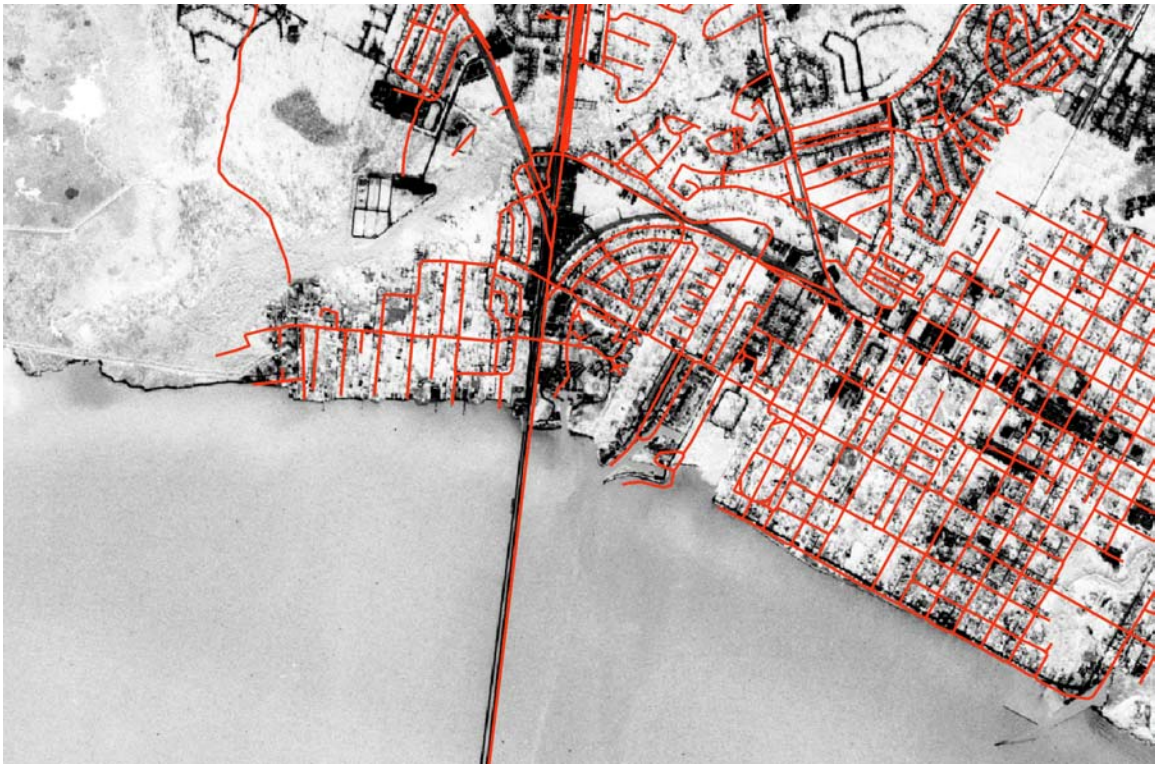

Figure 6 Mandeville Shoreline: TIGER 95 And SPIN-2 March, 1998. Scale 1:50000

What Was The Census Up To?

In 1999 it was clear to me what the Bureau of the Census was doing about TIGER. It was clear from press accounts that the Bureau did not want a replay of 1990, which was among the worst in Census history in terms of missed population elements. The Bureau worked hard to get address updates from local authorities so it could update its Master Address File. Moreover, politicians and celebrities, nationwide, were recruited to help encourage the public to cooperate with the population count.

These were national efforts. But some attention was paid to Louisiana and to TIGER. Contemporaneously with this LTIF funded project, the Census was proceeding on a parallel course using a different technology to evaluate TIGER's geodetic properties.

One of the properties of TIGER that annoys many GIS users, Planners, and Geographers is the often loose fit of TIGER lines to features on the ground. This kind of positional issue is the province of geodesy, the discipline of measurement of the Earth's shape. TIGER's innate design is not at all hostile to positional precision, but its original concept is based in topology. Topology concerns itself with spatial relationships such as connectedness and adjacency. In theory, at least, these properties can be studied without sub-meter accuracy in position. In fact, TIGER users are usually content to get within 10 meters of something on the ground, like a street's centerline.

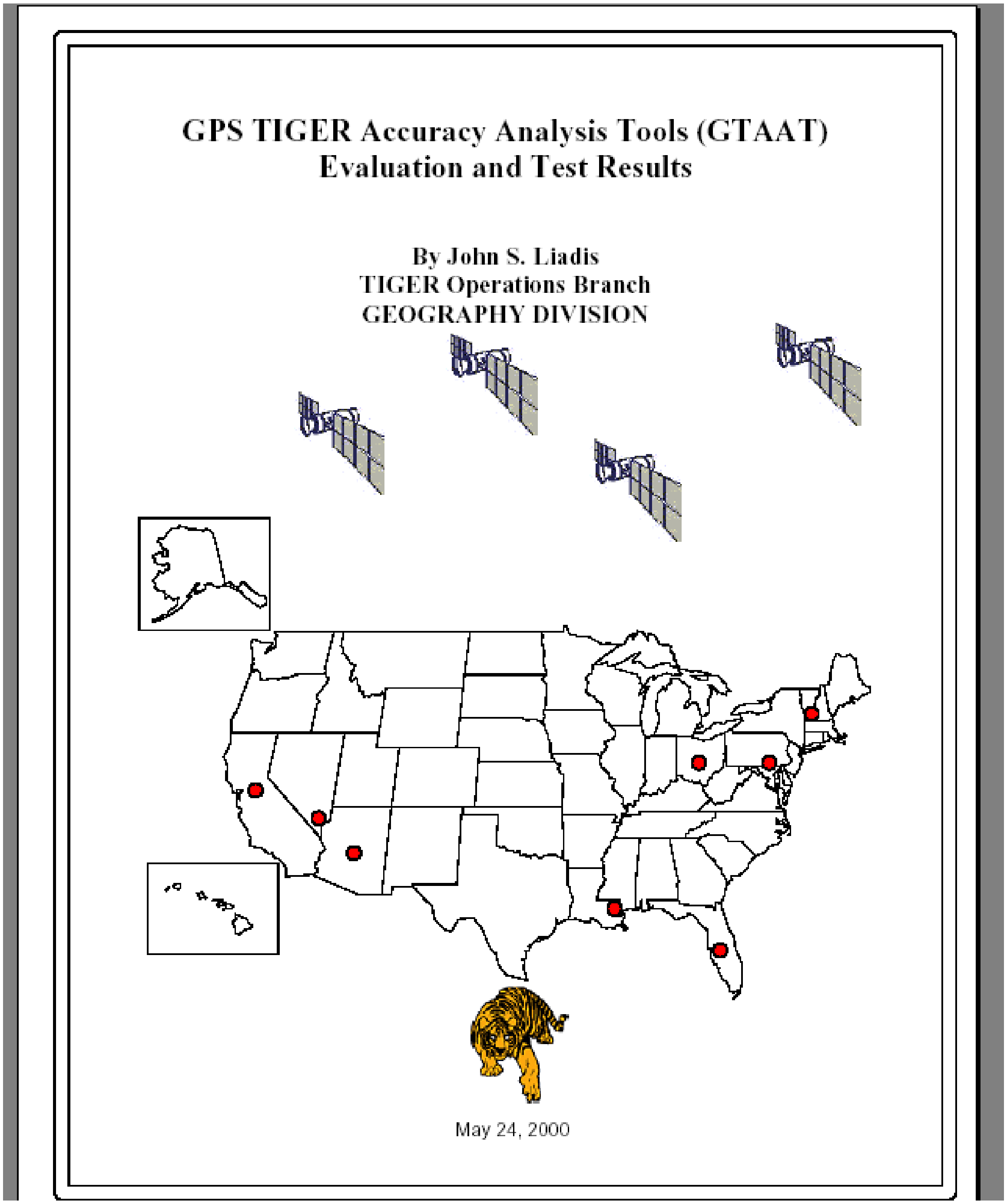

Figure 7 Census Accuracy Analysis

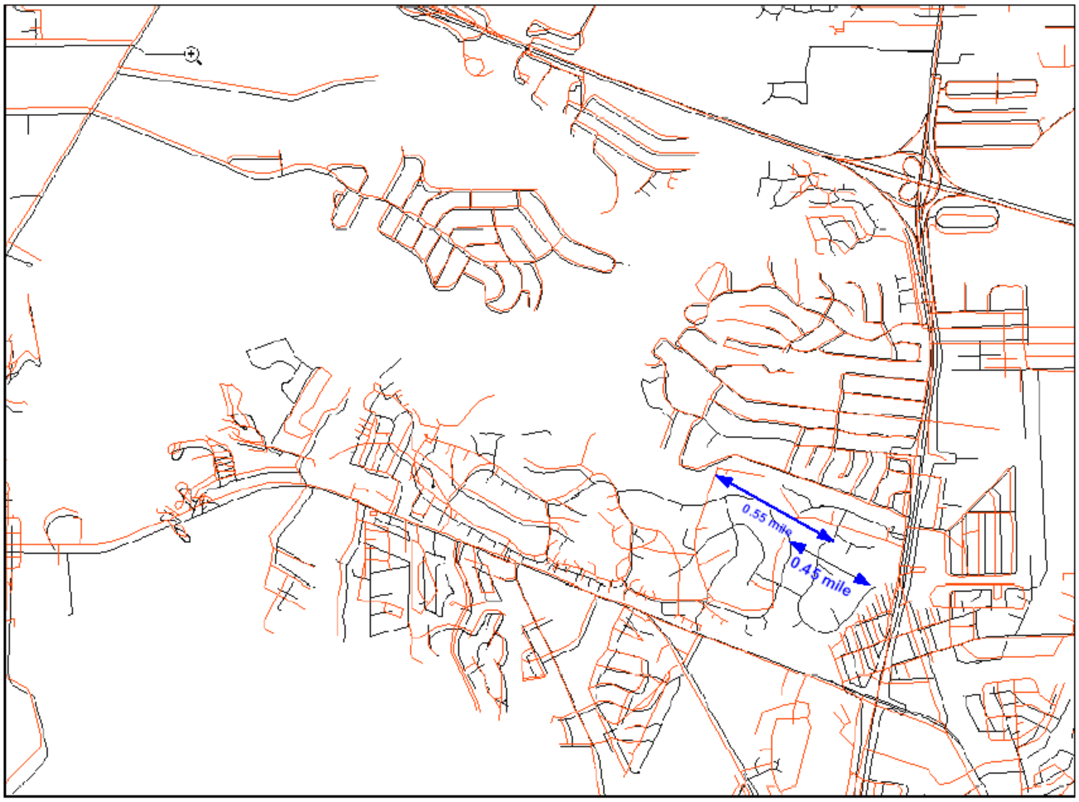

Figure VD5. Map displaying TIGER overlaid on local GIS file for Census Tract 403.04.

Figure 8 TIGER and Local GIS Comparison In St. Tammany Parish

Why the Census picked St. Tammany Parish for part of its geodetic study is unknown to me. But it is not unheard of for scientific investigations to converge independently on problems. St. Tammany was a problem in topologically for Louisiana, and geodetically for the Census. Still, this was an improbable convergence in geography.

More important, however, is the parallel strategy in validation. They did not rely on satellite imagery, but on satellite signals acquired on the ground by means of GPS (global positioning system) receivers. They also used, as Figures 8 and 9 show, map overlays like the one in Figure 2 (p. 7) of the proposal submitted to LTIF. A portion of that complex is at the very top and to the right of Figure 8.

Figure 9 shows the same region as Figure 8, but uses an aerial photo as backdrop. The badly mapped and topologically incomplete TIGER file clearly varies from the street network that apes the sinuous pattern of the Tchefunte River in the upper left of the aerial photo.

Figure VD6. Aerial displaying superimposed TIGER street feature network.

Figure 9 Raster / Vector Validation By Census: Beau Chene From the Air

Figure 9 raises the question of how well SPIN compares with aerial photography (assuming proper temporal resolution). That is, what we replicated what the Census did in Figure 9 with satellite imagery?

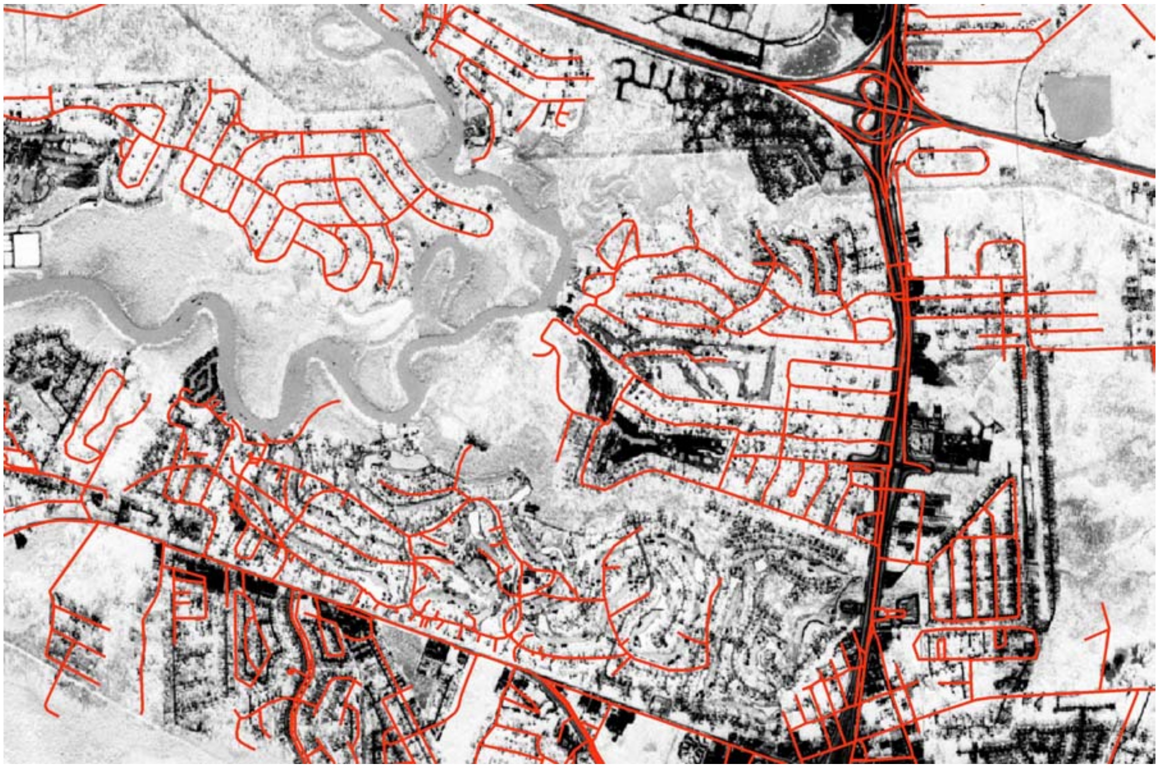

Figure 10 Beau Chene (Mandeville) Louisiana From Space

Satellite and Aerial Contrasts

In Figure 10 the same image reappears. The eye can make out the strong and weak points of TIGER in this area, a subdivision called Beau Chene, between I-12 and LA 22 west of US 190 in Mandeville – Covington. An observer, shown either rendering would come to the same substantive conclusions about both the topological and geodetic properties of TIGER.

This naturally raises the issue of whether or not we should prefer one data source to the other? Why should this project not have relied on aerial photography? Or better, now that recent aerial photography is available why not rely on it?

This is a perfectly fair question and it has two answers. First, the State has made high quality aerial photography with 1 meter resolution available for basically the whole state. Moreover, it is multispectral – colored.

To get an idea of how color infra-red (CIR) aerials compare to panchromatic satellite data consider Figure 11. It shows an area called North Park, a few hundred yards north of Beau Chene.

Figure 11 North Park (Covington) LA and TIGER 95

This area, too, has serious TIGER problems. What does it look like in color?

Figure 12 North Park in Color

For most observers the color image is more pleasing, even if infra red's representation of vegetation as red is unsettling at first. Moreover, there is higher spatial resolution. It is a very crisp image.

On the other hand it is harder to work with this kind of imagery. It takes more time and space to work with it.

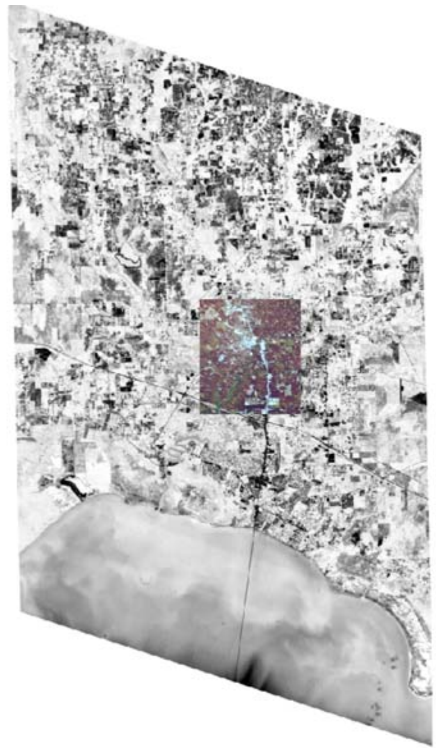

Figure 13 Equal File Size, Unequal Area

In Figure 12 we see the CIR image overlaid on the entire SPIN Panel. The factor that dictates the dimensions of the files is the capacity of a normal CD. Both images are roughly 0.5 GB. So, the attractiveness of aerial imagery is partially offset by its costs in time and storage. But, when it is available for an area of interest, it is a very useful source of data.

Detecting Change in TIGER: From the 90's to 2K+

At this point it is obvious that high resolution (< 5m) imagery can be a very effective tool for validating and diagnosing a system like TIGER. I presented results illustrating this to a national audience at the 2000 ESRI (Environmental Sciences Research Institute) Users Conference (June 26 – 30). The introduction is in the box below. The full paper is in the ESRI library at:

http://www.esri.com/library/userconf/proc00/professional/papers/PAP154/p154.htm

High-Resolution Satellite Imagery and Census Geography
It is no secret, especially to the former Soviet Union, that as Census 2000 approaches, TIGER is not always up-to-date. To help understand where TIGER lags, the State of Louisiana funded the acquistion of SPIN-2 1.56 meter pixel imagery of the New Orleans-Baton Rouge-Slidell triangle. Imagery was acquired in March 1998, and compared to TIGER 1997 in the summer of 1999. Comparisons with subsequent TIGER releases continue apace.

There is no simple theory of geography accounting for the SPIN-TIGER disparities, but this paper rounds up the "usual suspects" geographers rely upon to explain mapping anomalies. Understanding them may make planning Census 2010 easier.

Figure 14 presents a visually improved version of one of the main figures in the 2000 paper. In this report I have more flexibility with illustration file size. The basic idea is quite apparent. By use of color overlays it is easy to see where TIGER's later edition extended its tentacles. Urbanization missed by TIGER 95 and its subsequent refinements (such as TIGER 97 and 98) appears in TIGER 2000.

The differences, the new arcs, can be analytically separated from their ancestors by means of geoprocessing operations found in most GIS[3]. It is clear that in the case of St. Tammany Parish, which had already caught the attention of the Census, a lot of improvements showed up. Whether or not this is the case elsewhere is open to investigation.

The Future of This Project: Related Frontiers of Technological Innovation In Geography

The best way to perform these kinds of investigation is to rely on local experts familiar with a particular study zone. All geography is local, and there is no quick substitute for someone who knows an area of interest. This is a sociological as well as geographic fact. Finding automated substitutes for local experts is a problem rather like that of automated language translators. That is, context, important in both, is very hard to program. But it is probably worth the effort since automated techniques can assist experts as well as novices to an area of interest.

That is why there are two major paths to progress in enhancing the spatial auditing of systems like TIGER. One lies in progress in modeling urban growth. Are there laws that dictate how cities will expand? The second area lies in discovering and calibrating

[3] One approach is to find intersecting arcs in the 1995 and 2000 layers. Those not intersecting are the new street segments. They can be written to another file and subjected to either cartographic or statistical analysis.

statistical relationships between urban areas detected by remote sensing and demographic findings taken *in situ.*

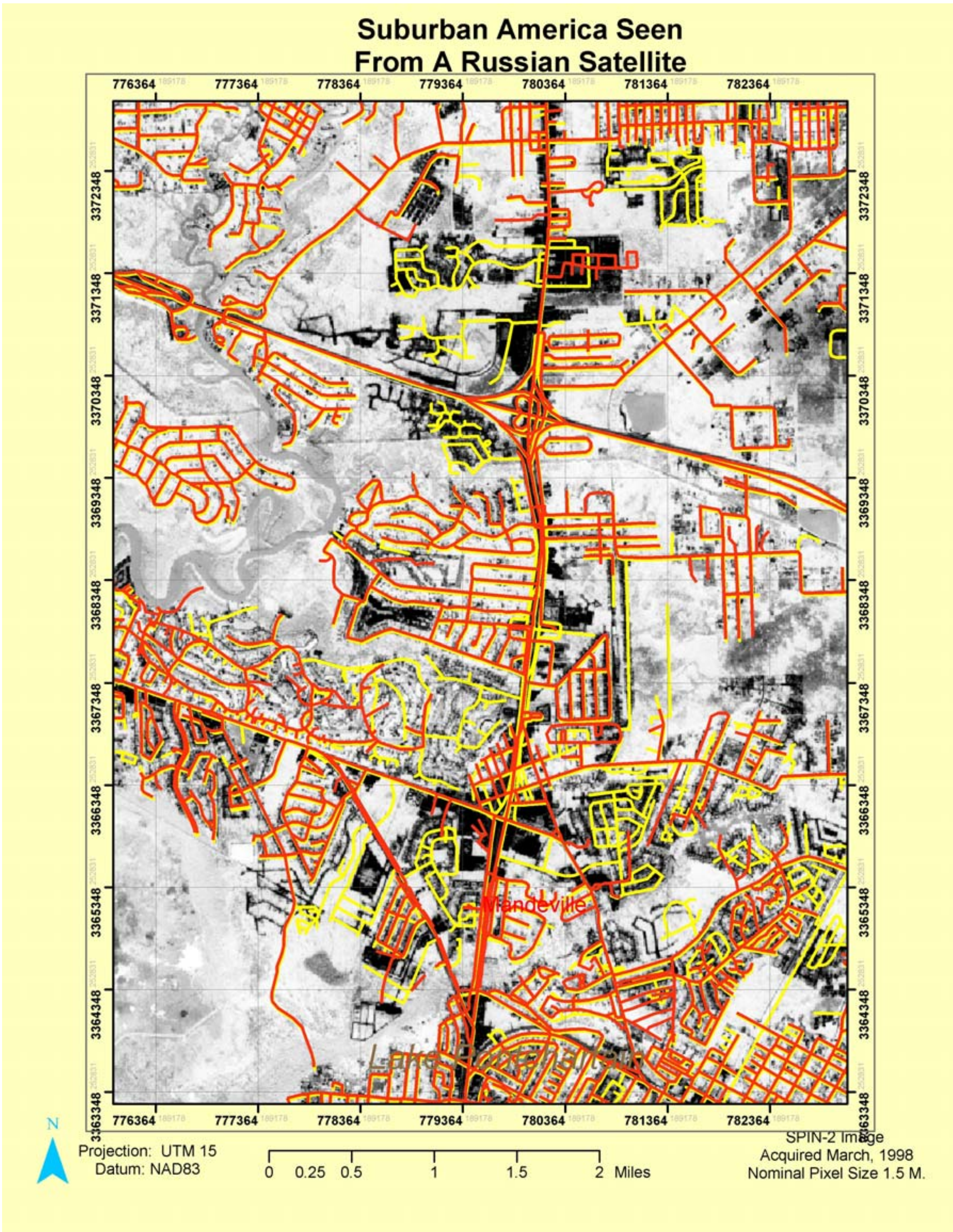

Figure 14 Differences Between Tiger '95 and Tiger 2K

Modeling Urban Growth

Something strange happened to many Western cities after WW I. By the 1920s self-conscious attempts to make "garden cities" were commonplace. The word "suburb" became a commonplace in English. A lot of this growth was spurred by the automobile and light rail commuter systems. The whole image of cities was changing from the dark and pessimistic mid-nineteenth century view of industrial cities made famous in Freidrich Engels' classic *The Condition of the Working Class in England* (1844). In one passage Engels wrote of Manchester's river Irk:

> a narrow, coal-black, foul-smelling stream, full of *debris* and refuse, which it deposits on the shallower right bank. In dry weather, a long string of the most disgusting blacking-green slime pools are left standing on this bank, from the of which bubbles of miasmatic gas constant arise and give forth a stench unendurable even on the bridge forty or fifty feet above the surface of the stream.[4]

The city planning movement of the early part of the 20th century hoped to mitigate this squalor by wiping out tenement slums, reducing density, and moving families to the suburbs. In the early part of the 21st century this movement is called "sprawl," and often today's planners want high density housing within walking distance of both business districts and urban green space.[5] This battle of morphologies is difficult to model, but a lot of the theoretical progress to date has centered around fractal geometry and the uses of fractal dimensions in morphometry.[6] The ideas emerging from fractal analyses largely point to urban growth taking place around the periphery of cities, and to notions of how to deal with asymmetric peripheral growth.

There is another issue, or side to this that LTIF's research at CUPA's LITSA lab has confirmed: infill. Infill occurs within the perimeter and is, thus, harder to find. The mathematics here are simple. Perimeter problems fall around a line defined as $\pi*d$, while infill patterns occur over a spaced defined as πr^2. This is an appreciably more taxing problem.

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[4] Tucker, Robert C., ed. 1972. *The Marx-Engles Reader.* New York: Norton. P. 431.
[5] Duany, Andres, Elizabeth Plater-Zyberk, and Jeff Speck. 2000. *Suburban Nation*: *The Rise of Sprawl and the Decline of the American Dream.* New York: North Point Press.
[6] Batty, Michael and Paul Longley. 1994. *Fractal Cities: A Geometry of Form and Function.* London and San Diego: Academic Press.

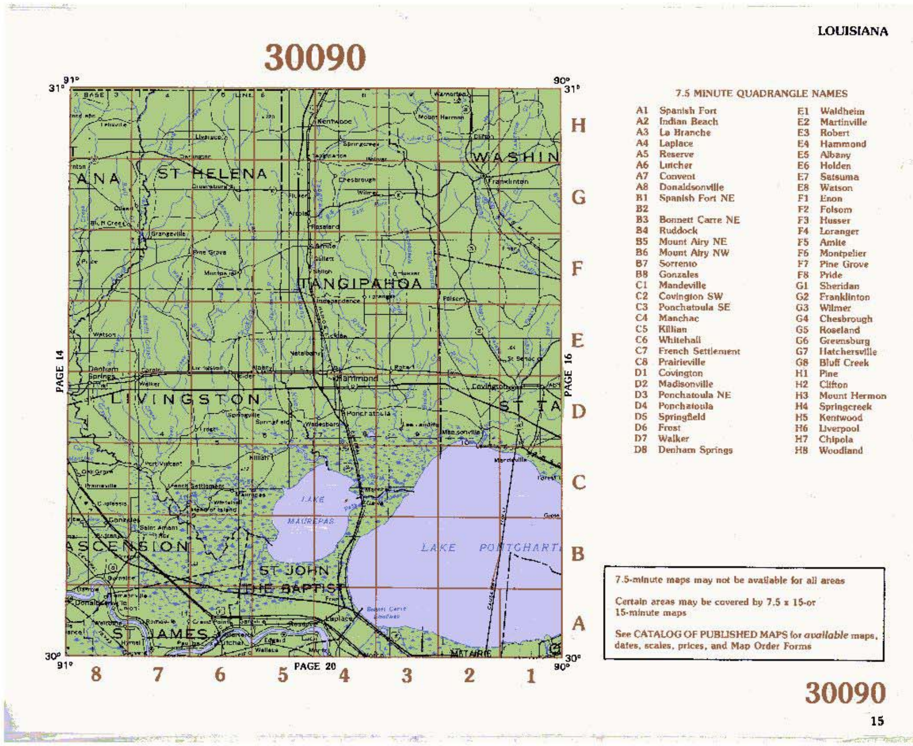

Figure 15 Western Pontchartrain Basin

One area of curiosity is what I call the Western Pontchartrain Basin. This zone includes the major approaches to Baton Rouge from the East – the New Orleans / Slidell axis. In this area three interstate highways converge: I10, I-12, and I-55. It is a natural area for growth.

In Figure 16 TIGER 95 data are overlaid on some neighborhoods in S.E. Baton Rouge. There are major gaps in the TIGER coverage. SPIN-2's resolution, even in this visually cramped format, delineates the driveways protruding from the roofs of single family dwellings.

It is these sorts of findings that need to be systematically tracked down. In this case, I was just lucky because the gap was so obvious. Other gaps are more scattered. Only a dim view of this shows up in the SPIN/TIGER view of the Hammond-Ponchatoula area. In this zone there are several small settlements that slip through TIGER's net. This is an area where searching for new neighborhoods may be materially assisted by automated feature extraction tools, or supervised classification based on multispectral imagery.

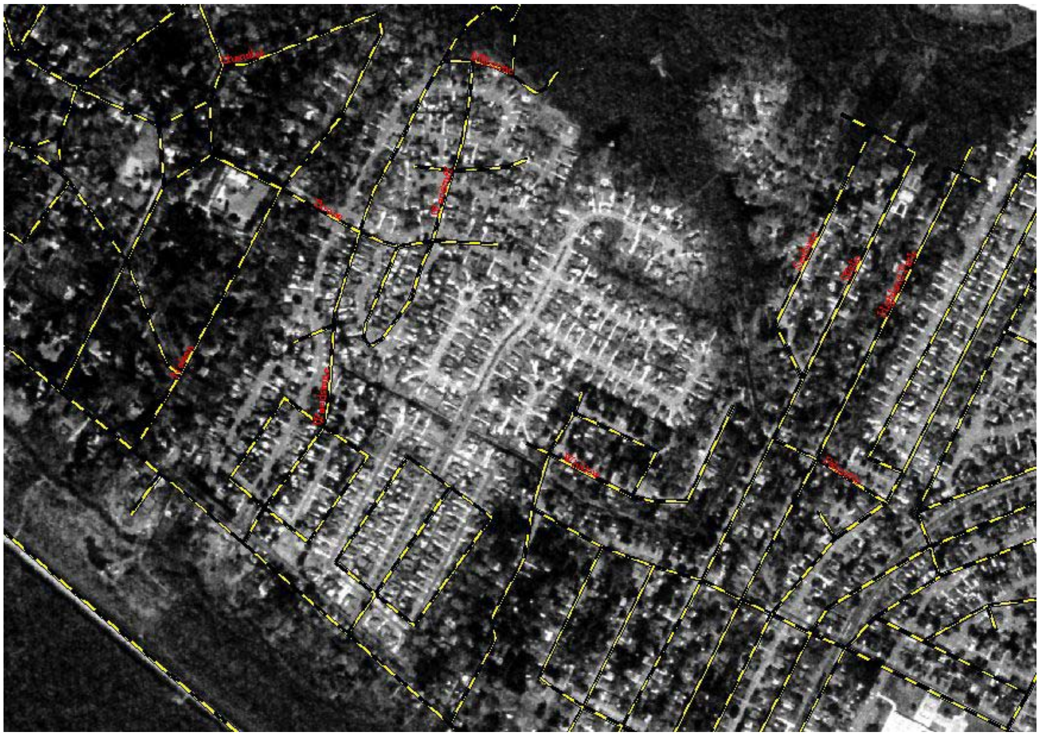

Figure 16 TIGER Overlaid on SPIN-2 Segment South of Baton Rouge

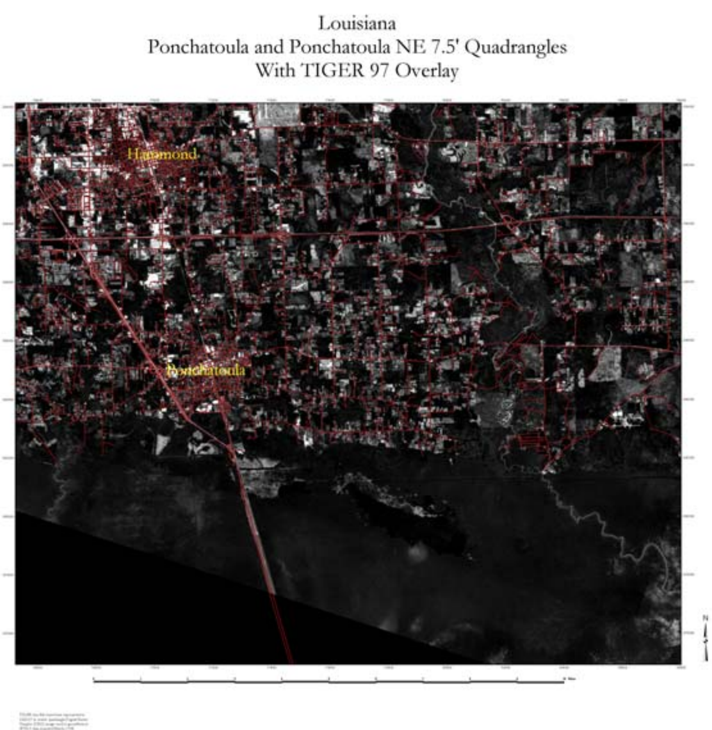

Figure 17 Infill In Hammond-Ponchatoula

The Estimation of Demographic Characteristics via Remote Sensing

Closely related to morphology, but analytically distinct, is the issue of density. As cities spread they create a footprint or spectral signature on the ground as empty land is converted to a cover of pavements, roofs, and cultivated greenery. As we have seen, even panchromatic imagery makes this pattern distinguishable in context. Multispectral imagery provides robust and well-understood models for extracting urban features at from pixel elements even larger than 30 meters. The 1980s vintage Multispectral scanners (MSS) featured 90 m pixels that are still useful for tracking changes in urban patterns.

We know that statistical estimation of population density at reasonable accuracy is possible by regressing urban area on census polygons.[7] But studies along this line need calibration. Otherwise, we are estimating one uncertainty from another uncertainty. The only way to calibrate is to try the same method in different places. In 2002 this laboratory began work on gathering global urban data to explore issues of both morphology and density estimation. The research goal is to develop an understanding of where to look for anomalies in vector GIS products like TIGER – to anticipate changes in population from changes in morphology. The data platform for doing is a U.S. product, the Enhanced Thematic Mapper (ETM+), or LANDSAT 7.
Data from ETM have several advantages, including good georeferencing, six bands useful for classification, and a 15 meter panchromatic band for resolution merging. ETM data are also very easy to acquire, they are inexpensive ($600 a scene), and have no licensing restrictions. LITSA's collection to date is deployed, in original format at ftp://olympic.urban.uno.edu.

This line of research is complementary to the use of high-resolution data such as SPIN-2 and instruments of its *genre*. ETM-based investigations are designed to provide a cheap path to economize on the acquisition and exploration of high-resolution data. There is no substitute for the detail and precision investigators gain from pixels less than 5 meters in resolution. It is very informative and persuasive. But it is also, as I pointed out above, tedious to explore without a smaller-scale, lower-resolution map derived from data that lack spatial precision, but provide very informative spectral resolution. Urban-oriented multispectral studies are still at the stage of innovation. [8]

Conclusions

The first question I have to ask it would I have attacked this project in 1999 knowing what I did at the end of 2001? No. I have had the benefit of a lot of training at ERDAS

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[7] Jensen, John. 2000. *Remote Sensing of the Environment.* New York: Wiley.
[8] Mesev, Victor and Paul Longley. 1999. "The Rôle of Classified Imagery in Urban Spatial Analysis", in Atkinson, Peter M. and Nicholas J. Tate, eds. *Advances in Remote Sensing and GIS Analysis.* Chichester, UK: Wiley. 187-206.

in Atlanta for remote sensing, and at ESRI in Redlands, CA for GIS. Both GIS and RS software have moved along a complete generation in technology in the last two years. In GIS one of the most helpful changes has been on-the-fly reprojection. It really works now. In RS the most important changes have been in making it easier to balance mosaicks (SPIN-2 creates a patchwork of images that have to be digitally merged into parallelograms), and in the introduction of artificial intelligence and neural networking for classification assistance. So, there are some things I am re-doing to take these changes into account.

A second question is how do we react to the twin issues of higher resolution imagery and cheaper moderate-resolution data. This is a cost benefit analysis that clearly demands a high tolerance for ambiguity and nuance. Like anyone, I enjoy a crisp and brilliant color image. But I also like blazing speed and statistically robust classifications. Right now, you can't have both at the same time. The moderate-resolution platforms like ETM have more bands and more spectral resolution, with lower prices. The exact opposite holds true for newer products like IKONOS. SPIN-2 is a very useful product since it straddles the gap between moderate resolution and very fine resolution. Its downside is its rather restrictive licensing policy, a hang-over from its cold-war espionage origins. The entire 60 by 90 mile data set LITSA has on hand is suitable for posting to an ftp site, but license restrictions need to be eased. Over time this should be negotiable.

The third question is the scientific status of this project. Two things bear pointing out. The basic strategy of validating TIGER via imagery holds up to hard scrutiny. The Census bureau's almost simultaneous TIGER validation strategy used satellites too, but active ones that broadcast GPS signals. In either case the fundamental scientific questions were the same: how valid is Census geography. Both answers were the same: there are remediable problems of both topology and geodesy. I am sure that some localities in Louisiana escaped enumeration by the Census. But the Census found out that there were problems in Louisiana, right where this research effort said they were, and took remedial steps. The 2000 TIGER files had more than 100 miles of additional roadways added to previous TIGER editions.

Finally, where do we go from here? The urgency over the 2000 is behind us. There is a window of a few years to develop theoretical models and empirical verification of urban change. The Census is open to an upward flow of information from local areas, and Louisiana is one of the most advanced states in keeping track of its land cover. From now until the 2010 Census, LITSA will work on improved exploitation of RS and TIGER data. For the medium term we will concentrate on modeling moderate resolution data because it is cheap, rich in urban-morphology detection capability, and regularly updated. As high resolution data becomes cheaper, and as computers become faster (two very likely events) the results will be directly applied to TIGER.